Section 3.15
HEALTH AND SAFETY

This section describes the existing health and safety resources in the area of the proposed Wild Horse Wind Power Project (WHWPP) in Kittitas County (County) near the City of Kittitas. It evaluates the potential impacts of the project on those resources and identifies mitigation measures to limit the impacts. The analysis in this section is primarily based on information provided by the applicant in the Application for Site Certification (ASC) (Wind Ridge Power Partners LLC 2004). Where additional information has been used to evaluate the potential impacts associated with the project, that information has been referenced.

3.15.1 Affected Environment

The proposed project would be built on open ridgetops on a predominantly shrub-steppe 8,600-acre rangeland site between the cities of Kittitas and Vantage. The site boundary (Figure 1-1) is located approximately 2 miles north of Vantage Highway and 11 miles east of the City of Kittitas. The most prominent geographic features in the area are Whiskey Dick Mountain (3,873 feet above mean sea level) and the Columbia River, located 10 miles to the east. The nearest residence to the project is approximately 1.75 miles to the south near Vantage Highway. The nearest residence to the transmission line that would connect to the existing Puget Sound Energy (PSE) Inter-Mountain Power line is approximately 0.25 mile from the proposed line. The nearest residence to the transmission line that would connect to the existing Bonneville Power Administration (BPA) Columbia to Covington 230 kilovolt (kV) line or the Grand Coulee to Olympia 287 kV line is approximately 0.5 mile from the proposed line. Access to the project site is via an existing private gravel road that branches from Vantage Highway at a location approximately 11 miles east of the City of Kittitas.

The project boundaries are not within an existing fire district. The Rural Ellensburg and Vantage fire districts are nearby to the west and east, respectively. A portion of the transmission line that would connect to PSE's Inter-Mountain Power line is within the Rural Ellensburg Fire District.

The project site is generally arid rangeland with a predominant groundcover of grasses and sagebrush. Fire is the primary health and safety risk at the site, especially during the hot, dry summer season. Fires could be started by lightning strike or by human activities

Existing conditions and uses associated with projects at the four alternative off-site locations include identifiable mechanical and electromechanical hazards, associated with everyday living working and traveling in a rural area.

Existing electrical transmission lines create the potential for electrical safety hazards in the immediate vicinity of the lines and the potential for personal injury, property damage, or fire in the event of transmission line failure or tower/pole collapse.

All off-site locations are also generally arid rangeland where human or lightning induced fire is a primary health and safety risk at these sites. As noted above, Kittitas County in general is located in an area with low lightning flash density (Figure 3.15-1).

Additional existing conditions are described below for each of the off-site alternatives.

3.15.1.1 Kittitas Valley Alternative

Two state highways, two county roads, and several private roads traverse the project area. Approximately 60 dwellings have been identified within one mile of the proposed project, the closest being located in the northeastern portion of the project area, within 790 feet of the nearest proposed wind turbine.

The project site is currently traversed by multiple sets of electrical transmission lines running east-west across the project site: one set of PSE lines and five sets of BPA lines.

3.15.1.2 Desert Claim Alternative

The Desert Claim Project area is served by a discontinuous system of two-lane county roads. Additional local land uses are accessed via dirt or gravel private roads that intersect the county road system.

An estimated 83 residences lie within one-half mile of the project boundary. Of these, 31 occupied residences (and one abandoned trailer shown as a residence) are located within the project area, or within 1,000 feet of the project boundary. Approximately 8 residences are located within the boundary of the project area. The Sun East Community lies within less than 1 mile north and east of the project area, and consists of 170 lots with 22 year round residents and a number of seasonal cabins.

Eight high voltage transmission lines either directly cross or are adjacent to the project area, with six owned and operated by BPA and, two owned and operated by PSE.

3.15.1.3 Springwood Ranch Alternative

The local road network surrounding the Springwood Ranch area consists of Interstate Highway I-90, State Route 10, and several county roads. Traffic from I-90 and surrounding roadways creates the potential for impacts between vehicles, as well as for vehicles to impact people and structures.

Existing electrical facilities within the Springwood Ranch site include low-voltage electrical distribution lines serving rural residences. The BPA transmission corridor with multiple lines passes approximately 2 miles to the north of this site.

The Springwood Ranch site is in a rural area with a low population density which includes scattered developed sites near Taneum Creek (to the south); nearby residences (to the east) along the Thorp Highway, and school and residential uses within the nearby community of Thorp. The Sunlight Waters residential/recreational community near the northwest corner of the site presents some residences that could be located within 500 feet of the hypothetical placement of a turbine.

3.15.1.4 Swauk Valley Ranch Alternative

The local road network in the vicinity of the Swauk Valley Ranch area includes Taylor Road that runs along Bristol Flat, a system of unimproved access roads, including Hart Road, and I-90 which lies just south of the Yakima River. The Burlington Northern railway also runs along Bristol Flat.

The Swauk Valley Ranch site is traversed by four transmission lines and has two radio facilities onsite.

Detailed analysis of the number of residents in the vicinity of the Swauk Valley Ranch project area has not been performed. Based on U.S. Census Bureau population estimates (2001) for Kittitas County, 8 to 79 people per square mile could currently reside in the vicinity of the Swauk Valley Project area. There are an estimated 60 residential structures within 1 mile of the proposed wind turbine strings. It is estimated that the residents would be concentrated along the river and to the south of the proposed site, as close as one-quarter mile to the hypothetical turbine layout.

3.15.2 Impacts of Proposed Action

Table 3.15-1 provides a comparison, by risk category, of the health and safety risks for each of the three possible development scenarios: 158 Turbines/1.0 MW, 136 Turbines/1.5 MW, and 104 Turbine/3 MW. For some parameters, the most likely scenario (136 Turbine/1.5 MW) is treated as the base case with a relative, qualitative assessment entered for the other two scenarios. A discussion regarding each risk category is provided in subsequent subsections.

Table 3.15-1. Summary of Potential Health and Safety Risks

Risk	104 Turbines/3 MW	136 Turbines/1.5 MW (Most Likely Scenario)	158 Turbines/1.0 MW
Construction Impacts			
Fire or Explosion[1]	Less than Most Likely Scenario	Primary Concern – Fire Protection and Prevention Plan to address.	Greater than Most Likely Scenario
Release of Hazardous[1] Materials	Less than Most Likely Scenario	Fuel, mineral oil, and lubricating oil spills possible. SPCC Plan to address.	Greater than Most Likely Scenario
Terrorism/Sabotage/ Vandalism	Same as Most Likely Scenario	Site access controlled. Security Plan to provide specifics.	Same as Most Likely Scenario
Operation and Maintenance Impacts			
Fire or Explosion[1]	Less than Most Likely Scenario	Primary Concern – Fire Protection and Prevention	Greater than Most Likely Scenario

Risk	104 Turbines/3 MW	136 Turbines/1.5 MW (Most Likely Scenario)	158 Turbines/1.0 MW
		Plan to address.	
Release of Hazardous[1] Materials	Less than Most Likely Scenario	Lubricating oil, ethylene glycol/water mix, hydraulic fluids, and mineral oil spills possible. SPCC Plan to address.	Greater than Most Likely Scenario
Gearbox– Lubricating Oil	110 gallons per turbine 11,440 gallons total	90 gallons per turbine 12,240 gallons total	70 gallons per turbine 11,060 gallons total
Cooling System – Ethylene Glycol/ Water Mix	55 gallons per turbine 5,720 gallons total	40 gallons per turbine 5,440 gallons total	30 gallons per turbine 4,470 gallons total
Hydraulic System – Hydraulic Fluid	85 gallons per turbine 8,840 gallons total	65 gallons per turbine 8,840 gallons total	45 gallons per turbine 7,110 gallons total
Substation Transformer– Mineral Oil	Same as Most Likely Scenario	12,000 gallons per transformer up to 24,000 gallons	Same as Most Likely Scenario
Pad-Mounted Transformer– Mineral Oil	500 gallons per transformer 52,000 gallons total	500 gallons per transformer 68,000 gallons total	500 gallons per transformer 79,000 gallons total
Maximum Tower Collapse Hazard Zone Distance/Risk	410 feet/Same as Most Likely Scenario	344 feet/Low	295 feet/ Same as Most Likely Scenario
Estimated Maximum Blade Throw Distance/Risk	410 feet/ Same as Most Likely Scenario	344 feet/Low	295 feet/ Same as Most Likely Scenario
Estimated Maximum Ice/Blade Fragment Throw Distance/Risk	Same as Most Likely Scenario	328 feet/Low	Same as Most Likely Scenario
Shadow-Flicker	None	None	None
Terrorism/Sabotage/ Vandalism	Same as Most Likely Scenario	Site access controlled. Motion sensors and security lighting to be installed. Security Plan to provide specifics.	Same as Most Likely Scenario
Electromagnetic Field	Same as Most Likely Scenario	Minimal field strengths at existing nearby residences.	Same as Most Likely Scenario
Electrical Shock	Same as Most Likely Scenario	Minimal hazard. Applicant committed to grounding metal objects along transmission line routes.	Same as Most Likely Scenario
Decommissioning Impacts			
Fire or Explosion	Similar to Construction		
Release of Hazardous Materials	Similar to Construction		
Terrorism/Sabotage/ Vandalism	Similar to Construction		

[1] Risk primarily a function of the number of towers.

3.15.2.1 Construction Impacts

Fire and Explosion

The risk of fire is the primary health and safety concern associated with the proposed project, regardless of which development scenario would be implemented. The incidence of fire or explosion during construction could be due to lightning strikes, terrorism, sabotage, vandalism, aircraft impact, or human activities associated with the construction work.

Lightning

As shown in Figure 3.15-1, the Kittitas Valley and interior Washington, in general, do not have a high lightning flash density. The area falls in the second-lowest of eight categories of lightning intensity. The map is based on data from lightning flash sensors installed nationwide over a 4-year period. The risk associated with lightning strikes should be essentially the same for each project development scenario. However, the incidence of lightning strikes may increase over natural conditions due to the presence of project facilities.

Construction Activities

Because the project site is generally arid rangeland with a predominant groundcover of grasses and sagebrush, the greatest risk of fire would be during the hot, dry summer season. Once started, a range fire could spread rapidly. The rate, extent, and direction of spread would be governed by the location of the fire, available fuel, temperature, wind speed and direction, presence/absence of fire breaks, and response time and capability of onsite personnel and emergency responders. Fire breaks would include onsite roads, the Vantage Highway, and the Columbia River. Nearby residences, although more than 1.75 miles from the site, could be impacted by a fire.

Fire sources associated with construction activities include dry vegetation coming in contact with hot exhaust catalytic converters under vehicles, smoking, use of explosives, electrical arcing, hot exhaust from portable generators, and use of welding torches. The applicant has committed to implementation of mitigation measures, listed in Section 3.15.4, to address each of these potential sources.

A concern regarding range fires was expressed by the Kittitas County Department of Building & Fire Safety in a letter (Kittitas County 2004) to the Washington Energy Facility Site Evaluation Council (EFSEC) dated April 22, 2004. The letter stressed the need to confirm that: communications with emergency responders would not be disrupted by project facilities; Federal Aviation Administration (FAA)-style lighting be employed to prevent aircraft mishaps; a water supply be available for fire fighting; all construction sites conform to Kittitas County Public Works criteria; agreements be established for providing emergency services; and all workers be given fire-prevention training.

The applicant stated in the ASC that it is in the process of determining which fire district would be responsible for fire protection services and that the information would be submitted, as part of the Fire Protection and Prevention Plan, to EFSEC. The Fire Protection and Prevention Plan would be approved by EFSEC and the chosen fire district prior to the start of construction.

Release or Potential Release of Hazardous Materials

Fuel

Construction of the proposed project would require the use of diesel and gasoline fuels for operating construction equipment and vehicles. The contractor would utilize fuel trucks for refueling cranes and large earth-moving equipment and fuel storage tanks. The fuel trucks would drive to the equipment and tank (1,000-gallon capacity) locations and would incorporate automatic shutoff devices to limit accidental spills. Some construction vehicles could refuel at nearby gas stations.

Lubricating Oils

Lubricating oils would be present in construction vehicles and equipment. Small quantities of lubricating oils may also be stored at construction staging areas.

Transformer Mineral Oil

The substation for the proposed project would contain one or two large power transformers. The transformers would be filled with mineral oil via a truck after delivery and installation on the site. The pad-mounted transformers at the base of the towers or located in the nacelles would be filled at the factory.

Spill Prevention, Control, and Countermeasures Plan

Spills of fuels, lubricating oils, and mineral oil could occur as a result of vehicle accidents, equipment malfunction, human error, terrorism, sabotage, vandalism, or aircraft impact. The applicant has committed to preparing a Spill Prevention, Control, and Countermeasures (SPPC) Plan addressing potential spills, prevention measures, and response procedures should a spill occur. The SPCC would be submitted to EFSEC and local emergency response organizations for review and approval prior to the start of construction.

Spills, should they occur, would likely be confined to the project site.

Radiation

The applicant stated in the ASC that no radioactive materials would be used, consumed, or released during construction of the proposed project.

Terrorism, Sabotage, and Vandalism

The applicant's site project manager would work with a security contractor to develop a plan to effectively monitor the overall site during construction, including drive-around security and specific checkpoints. EFSEC, as well as local emergency response organizations, where appropriate, would review and approve all plans before they are implemented. The Security Inspection and Monitoring Plan would be modified, as appropriate, based on the level of construction activity and amount of sensitive or vulnerable equipment in specific areas. Site access would be controlled, and all onsite construction staff and visitors would be required to carry an identification pass.

Construction materials would be stored at the individual turbine locations, or at the lay-down area around the perimeter of the operations and maintenance facility and site construction trailers. Temporary fencing with a locked gate may be installed at the lay-down areas for storage of equipment or materials.

3.15.2.2 Operation and Maintenance Impacts

Fire and Explosion

Lightning

As noted under the construction subsection, the project site is in an area of relatively low lightning flash density. Because of the nature of the terrain and area vegetation, the occurrence of lightning strikes may increase due to the presence of proposed project structures. The frequency of lightning strikes would likely be a function of the height of the wind turbine generators (WTGs) and be proportional to the number of project structures installed (i.e., which alternative is selected). The WTGs and substation would include lightning protection systems.

Wind Turbine Generators

A fire could occur in the WTGs as a result of equipment malfunction, lightning strike, electrical short, terrorism, sabotage, vandalism, or aircraft impact. Temperature sensors would detect internal fires and send an alarm signal to the central SCADA system, which would notify project operators of the situation.

Electrical Equipment

A fire could occur in the project's electrical equipment as a result of equipment malfunction, lightning strike, electrical short, terrorism, sabotage, vandalism, or aircraft impact. Mineral oil-level detectors in the substation transformers would detect a level change and send an alarm signal to the central SCADA system, which would notify project operators of the situation.

As indicated under construction, the applicant stated in the ASC that it is in the process of determining which fire district would be responsible for fire protection services, and that the information would be submitted, as part of the Fire Protection and Prevention Plan, to EFSEC. The Fire Protection and Prevention Plan would be approved by EFSEC and the chosen fire district prior to the start of construction.

Release or Potential Release of Hazardous Materials

Wind Turbine Generators

There are three main types of fluid in a WTG: cooling fluid for the generator (a mix of glycol and water similar to that used in automobile cooling systems), lubricating oil (typically synthetic) for the gear box, and hydraulic oil for operating the blade pitch system, yaw mechanism, and brakes. The WTGs would be equipped with sensors to detect loss in fluid pressure. Any fluid leaks, if they were to occur, should remain within the nacelle or turbine tower. All of the fluids would be replaced periodically. The replacement procedure would be carried out by the operations staff using small (typically 5-gallon) containers to transport the new and used fluids. The fluids would be stored in 50-gallon drums on a diked/bermed concrete pad inside the project's operations and maintenance facility. Waste fluids would be transported from the site by a licensed contractor. Because of restricted access to the site, the public would not normally be at risk due to the release of WTG fluids, if it were to occur. WTG fluid leaks could result from equipment failure, lightning strikes, terrorism, sabotage, vandalism, or aircraft impact.

Electrical Transformers

The project would utilize pad-mounted and large substation power transformers. A pad-mounted transformer would be located at the base of each tower and would contain up to 500 gallons of mineral oil. The pad-mounted transformers would not be provided with a containment berm. This is consistent with the design of electrical distribution systems that are not located in environmentally sensitive areas. If a leak were to occur, the mineral oil would leak out down to the level of the breach in the transformer tank and run unchecked onto the ground. The substation would utilize one or two power transformers, each containing up to 12,000 gallons of mineral oil. The power transformers would be equipped with an oil-level monitoring system. A loss of oil level would be sensed and an alarm message sent to the central SCADA system. The power transformers would be surrounded by a containment berm or trough to retain any oil that leaked from the transformers. Transformer leaks could result from equipment failure, lightning strikes, terrorism, sabotage, vandalism, or aircraft impact.

Spill Prevention, Control, and Countermeasures Plan

The SPCC Plan developed for the construction phase would be revised to reflect the as-built conditions. SPCC plans are required by regulation to be reviewed and updated, as appropriate, at a minimum every 2 years. The plans must be stamped by a registered professional engineer.

Spills, should they occur, would likely be confined to the project site.

Radiation

The applicant stated in the ASC that no radioactive materials would be used, consumed, or released during operation of the proposed project.

Ice and Blade Fragment Throw from Turbine Blades

Ice can form on wind turbine towers and rotor blades. Moving rotor blades are subject to heavier buildups of ice than stationary blades. The applicant has estimated that icing conditions could occur on an average of 3 to 5 days per year and that the distance of the maximum ice throw, if it were to occur, would be 328 feet. The ice throw hazard area would extend perpendicular to the wind direction and downwind from the turbine. The ice throw hazard area would extend about 80 feet upwind of the turbine. The ice throw hazard area is illustrated in Figure 3.15-2.

Blade fragment throw risk would be similar to that for ice throw. Blade fragment throw would most likely be the result of terrorism, sabotage, vandalism, or a lightning strike. The hazard zone for blade fragment throw should be approximately that for ice throw.

Because of the significant distances from the proposed tower locations to existing residences and public roads, and restricted site access, the proposed project should not result in any risk to the public due to ice or blade fragment throw.

Turbine Tower Collapse

The ASC states that the applicant is not aware of any documented collapse of a tubular tower wind turbine. The applicant sought confirming information from Worldlink Insurance Company in Palm Springs, California. As documented in the ASC, Worldlink stated that it insures more than 17,000 WTGs and was not aware of any tubular wind tower collapses. The Kittitas Wind Power Project prefiled testimony of Henrik Jorgenson, Vice President of Technology for Vestas Wind Systems A/S in Denmark, however, identified two instances where tubular towers did collapse. One collapse (V39 turbine in France) was due to an over-speed condition and the other (V80 turbine in Germany) resulted from a weak weld in the tower flange. The applicant indicates in the ASC that access to the project site would be restricted. Restricted site access combined with the large distances to existing residences and public roads should result in minimal risk to the public if a turbine tower were to collapse.

Turbine Blade Throw

Possible causes of a loss of a turbine blade are equipment failure, improper assembly, terrorism, sabotage, vandalism, or a lightning strike. The Kittitas Wind Power Project prefiled testimony of Henrik Jorgenson, Vice President of Technology for Vestas Wind Systems A/S in Denmark, noted one occurrence with a Vestas V39-500kW turbine in Denmark in 1992 where a blade was thrown 50 to 75 meters. The failure analysis determined that the blade to hub fastening system had failed due to a combined manufacturing and design defect. The applicant estimated the worst-case blade throw distance to be approximately one turbine tip-height. As indicated under the tower collapse discussion above, restricted site access combined with the large distances to existing residences and public roads should result in minimal risk to the public if a turbine blade were to be thrown.

Shadow-Flicker

Shadow-flicker caused by a wind turbine is defined as alternating changes in light intensity when the moving turbine blades cast shadows on the ground or objects (including windows of residences). Shadow-flicker can occur in project-area homes if a wind turbine is located near a home and is in a position where the blades interfere with very low-angle sunlight. The result can be a pulsating shadow in the rooms of the residence facing the wind turbine and subject to the shadow-flicker effect. Such a location is called a "shadow-flicker receptor." Visual obstacles (e.g., terrain, trees, or buildings) between the wind turbine and a shadow-flicker receptor can reduce or eliminate the shadow-flicker effect. Shadow-flicker frequency is related to the rotor speed and number of blades on the rotor. In addition to being an annoyance, concerns have been raised regarding shadow-flicker causing epileptic seizures.

The proposed project should not produce shadow-flicker effects on any existing residences in the area because the residences are too far from the turbines and are additionally shielded by existing terrain that separates them from the turbines.

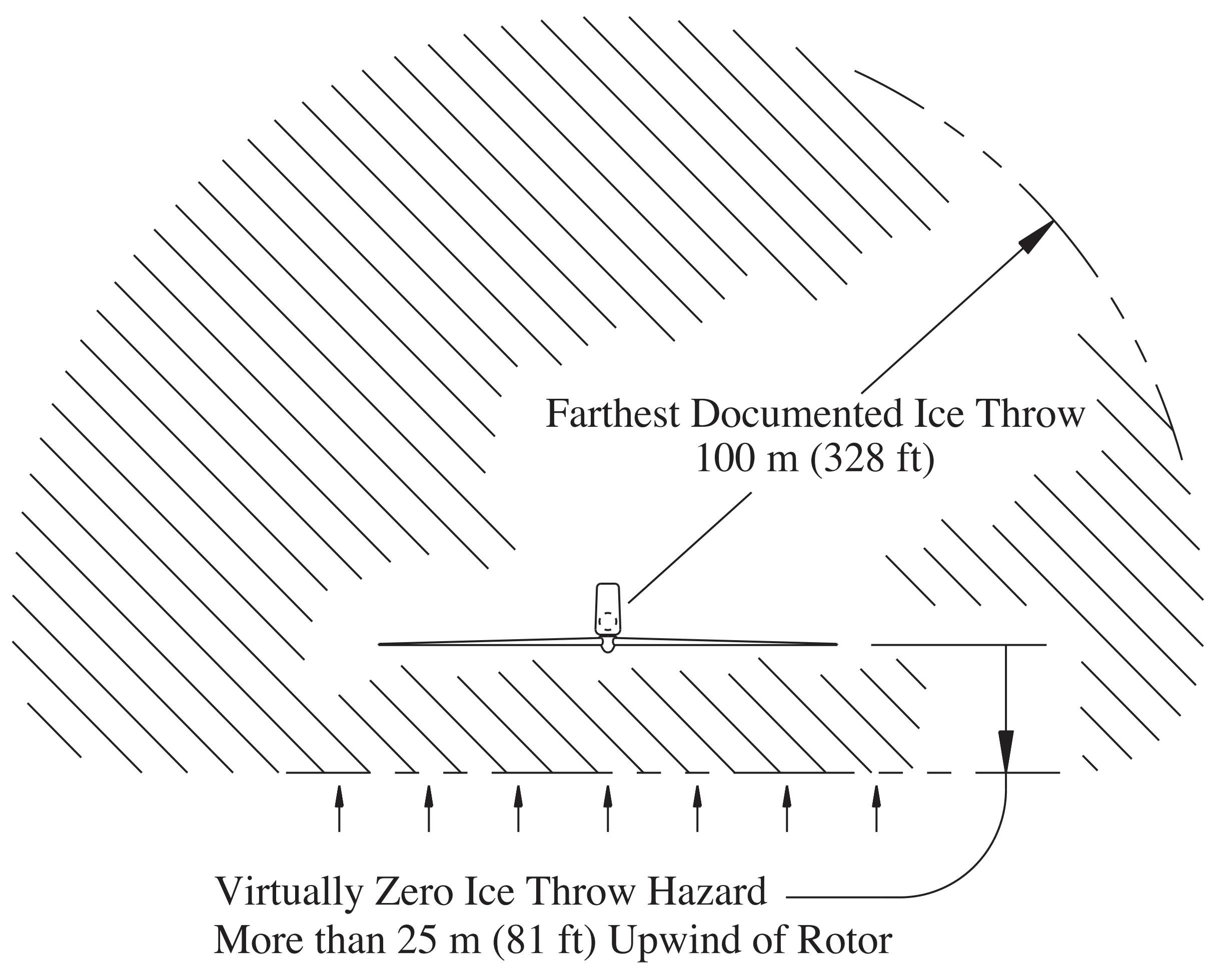
Electric and Magnetic Fields

Background

Electric and magnetic fields are produced by any device that consumes or conducts electricity, such as electrical transmission and distribution lines, lights, televisions and radios, shavers and hair dryers, electric blankets, computers, cellular phones, microwave ovens, and other appliances. All of the electrical wiring in homes and office buildings, for example, emit electromagnetic fields (EMF) when the power is on. The voltage on transmission line conductors (wires) produces an electric field in the space between the conductors and the point of measurement. Electric field strength for transmission lines is expressed in units of volts per meter (V/m) or kilovolts per meter (kV/m) at a height of 3.28 feet above the ground. The magnetic field is a function of the current flowing in the conductors. The magnetic field is expressed in milligauss (mG) and is also reported at a height of 1 meter above the ground. The strengths of the electric and magnetic fields associated with transmission lines generally decrease as the distance from the conductors increases. Computed electric field values at the edge of the right-of-way, for a given line height, are fairly representative of what can be expected along the transmission line corridor. However, the presence of vegetation on or at the edge of the right-of-way can reduce the actual electric field strengths below the calculated values. The arrangement of the conductors on the transmission line towers can also affect the field strengths. A triangular arrangement of the transmission line conductors can result in electric and magnetic field levels below what they would be for a horizontal arrangement. The presence of other transmission lines can also affect the field strengths, resulting in higher or lower values.

Regulatory Considerations

There are currently no national standards in the United States for 60-hertz electric and magnetic fields. The State of Washington does not have guidelines for electric or magnetic fields from transmission lines. BPA has established an electric field strength standard of 9 kV/m maximum on the right-of-way and 5 kV/m at the edge of the right-of-way. BPA has also set maximum



Source: Wind Ridge Power Partners, LLC 2004.

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Figure 3.15-2
Blade Ice Throw and Blade Fragment Throw Hazard Zone
WILD HORSE WIND POWER PROJECT

allowable electric field strengths of 3.5 kV/m and 2.5 kV/m for shopping center parking lots and commercial/industrial lots, respectively. All BPA lines are designed and constructed in accordance with the National Electrical Safety Code. The code specifies the minimum allowable distances between transmission lines and the ground or other objects. These requirements help determine the width of the right-of-way.

Health Effects

We are all exposed to varying levels of EMF. Concern regarding the possible health effects of exposure to EMF has led to extensive research. The human health research regarding EMF over the years has been primarily focused on whether or not a cause-and-effect association can be made between EMF and cancer, and whether there exists a biological mechanism by which EMF exposure can cause cancer. None of the proposed biological mechanisms has held up under additional testing, and the laboratory studies of living animals do not show that EMF can cause cancer. Following its evaluation of the body of scientific literature available through 1998, the National Institute of Environmental Health Sciences (NIEHS) concluded that the majority of animal studies provide evidence that EMF does not cause cancer or the promotion of cancer in exposed animals, and provide no basis to conclude that EMF affects cancer (NIEHS 1998).

The question of power lines and cancer arose because some epidemiology studies (i.e., studies of disease occurrence in people) had reported a link with some kinds of cancer. This link is a statistical association, which in some studies indicated that more of the children who had cancer had lived closer to certain types of power lines, or were exposed to higher estimated magnetic fields (Feychting and Ahlbom 1993, Savitz et al. 1988, and Wertheimer et al. 1979). However, because the meaning of these results was not clear, additional studies were undertaken. These studies did not show convincing evidence of links between EMF and childhood cancer (Green et al. 1999a and 1999b, Gurney et al. 1996, Kleinerman et al. 2000, Linet et al. 1997, Martin et al. 1996a and 1996b, McBride et al. 1999, and U.K. Childhood Study Investigators 1999). Studies of higher exposures that occur at workplaces have not found links with cancer overall, and have not shown strong, convincing links with any specific type of cancer (NIEHS 1998).

In recent years, the U.S. government has focused its efforts on the EMF Research and Public Information Dissemination (RAPID) program, which has included a number of whole-animal research studies, and the 1998–1999 NIEHS evaluation of scientific research noted above. NIEHS reviewed both epidemiologic and laboratory research related to cancer, as well as non-cancer endpoints. Both epidemiology and laboratory studies are relevant for assessing possible effects of exposure on human health. Laboratory studies of animals conducted as part of the NIEHS program and those published after the NIEHS report provide no basis to conclude that EMF affects cancer risk; animals exposed for long periods of time did not develop any more cancer than unexposed animals.

NIEHS concluded that while EMF exposure “cannot be recognized as entirely safe,” the evidence for risk to cancer and other diseases was “weak” and the probability that EMF exposure is a health hazard is “small” and “insufficient to warrant aggressive regulatory concerns.” NIEHS found a lack of consistent positive findings in animal or mechanistic studies, but statistical studies looking at the incidence of disease in a population (epidemiology) raised concerns over childhood leukemia and adult chronic lymphocytic leukemia from occupational exposure. Because everyone is exposed to EMF and because the epidemiological studies showed areas of concern, NIEHS recommend continued research and passive regulatory action such as a continued emphasis on educating both the public and the regulated community on means aimed at reducing EMF exposure.

The health effects of EMF are likely to continue to be controversial. It is a subject that is a recognized limitation of science. It is currently difficult to prove or disprove the effects of EMF exposure.

Project-Specific Field Strengths

EMF associated with power lines primarily depends on the design of the line, voltage of the line, current in the conductors, and distance from the line. The applicant estimated the electric and magnetic field strengths that would be experienced at various distances from the centerline of the transmission line rights-of-way for the proposed line configurations. The electric field strength depends on the voltage of the line and remains fairly constant at any given location under normal operating conditions. The magnetic field, however, depends on the current in the conductors, which can change frequently. Maximum magnetic fields are produced at the maximum conductor currents. For the proposed project, the applicant assumed a line voltage of 230 kV and a peak current flow in each conductor of 530 amperes. Magnetic field strengths were calculated to be a maximum of 107.4 mG at the center of the right-of-way and 19.6 mG at the edge of the right-of-way (75 feet from the centerline). The analogous electric field strengths were calculated to 2.66 kV/m and 0.56 kV/m, respectively. The magnetic and electric field strengths were calculated to be less than 0.12 mG and 0.001 kV/m, respectively, at the nearest existing residence.

Audible Noise and Electromagnetic Interference

Corona is the partial electrical breakdown of the insulating properties of air around the conductors of a transmission line. For the same voltage, a larger diameter conductor would normally produce lower corona than a smaller diameter conductor. Also, irregularities (e.g., nicks, scrapes, and burrs) on the conductor surface can cause localized increases in corona. Corona-generated noise can be characterized as a hissing, crackling sound and is a concern primarily for transmission lines operating at voltages of 345 kV and higher. Corona on transmission lines can also produce electromagnetic noise in the frequency bands used for radio and television signals and, thus, cause radio and television interference. Like the audible noise, electromagnetic noise is primarily associated with transmission lines operating at voltages of 345 kV or greater. The project's transmission lines would operate at 230 kV, and are therefore unlikely to be a significant source of corona noise.

Electric Shock

Transmission lines, like the electrical wiring in a home, can cause serious electric shocks if precautions are not taken in their design, construction, and operation. Transmission lines can induce voltages onto metal objects near the lines. This can lead to nuisance shocks if a voltage is induced onto something, like a wire fence, that is installed in close proximity to the transmission line. However, should a shock hazard develop, grounding techniques can be used to eliminate the problem. The applicant has indicated that in areas where the transmission line parallels wire fence lines, the fence lines, whether owned by the applicant or others, would be grounded by the applicant with a copper grounding rod and ground straps at adequate intervals to reduce the potential shock hazard.

Terrorism, Sabotage, and Vandalism

Site visitors, including vendor equipment personnel, maintenance contractors, material suppliers, and all other third parties, would require permission for access from authorized project staff prior to entrance. The project operations manager, or designee, would grant access to any critical areas of the site on an as-needed basis. Site access would be controlled, and all visitors or contractors on the site would be required to carry an identification pass.

Both the operations and maintenance facility and the main substation would be equipped with outdoor lighting and motion sensor lighting. The main substation would also be visible from the operations and maintenance facility. The substations would be surrounded by an 8-foot-tall chain-link fence with barbed wire along the top and locked gates. All wind turbines, pad-mounted transformers and switch panels, and other outdoor facilities would have secure, lockable doors.

The project operations group would prepare a detailed security plan to protect the project and project personnel. EFSEC, as well as local emergency response organizations, would review and approve all security plans before they were implemented.

3.15.2.3 Decommissioning Impacts

Fire and Explosion

The risk of fire and explosion during decommissioning would be similar to that during construction.

Release or Potential Release of Hazardous Materials

The risk of release or potential release of hazardous materials during decommissioning would be similar to that during construction.

Terrorism, Sabotage, and Vandalism

The risk of terrorism, sabotage, or vandalism during decommissioning would be similar to that during construction.

3.15.3 Impacts of Alternatives

3.15.3.1 Impacts of Off-Site Alternatives

Several impacts are common to all off-site alternatives. Construction-related risks include unintentional or accidental fire or explosion during project construction, especially during the hot, dry summer season. Unintentional or accidental fire or explosion risks during project operations and maintenance include human activities, such as cigarette smoking; use of vehicles off established roadways; and mechanical malfunction inside the WTGs and at other project facilities. Lightning-induced fires are rare in the project area. The wind turbines would be equipped with lightning protection systems to reduce the risk of lightning-induced fires.

Potential sources of hazardous materials include fuel and oils from construction equipment and mineral oil used to fill substation transformers during project operations. Periodic changing of lubricating oils and hydraulic fluids used in the individual turbines would result in the generation of small quantities of hazardous waste. Spills would be addressed in accordance with a project SPCC Plan.

Potential safety risks during project operations include ice falling off of rotating turbine blades, blade throw (blade fragments thrown from a rotating turbine), and potential collapse of turbine towers. The collapse of a turbine tower constructed in accordance with international standards and local building codes is highly unlikely, as is the potential for ice or blade fragment throw. There is a possibility of ice throw, but studies have shown that no ice fragments have been thrown distances of more than 100 meters. The level of impact to the public will depend on the number of residences in close proximity to the project area, and the proximity and level of use of private and public roads. Establishing exclusion zones or setbacks around turbines can adequately mitigate for these hazards.

Substations and other electrical facilities would be designed and constructed with systems that would protect project personnel and minimize accidental exposure to high-voltage electrical equipment. Areas near the project power collection cables and transmission line would not be accessible to the public, and safety precautions would be required. Changes in exposure to electric and magnetic fields would be small for the public, and impacts associated with possible long-term health effects are highly unlikely. The electrical facilities within each of the off-site alternatives would be highly unlikely to cause short-term electric or magnetic field effects because facilities produce fields of low strength and may be buried underground.

As noted above for the Project Action, all off-site alternative sites are in an area of relatively low lightning flash density. Because of the nature of the terrain and area vegetation, the occurrence of lightning strikes may increase due to the presence of proposed project structures. The frequency of lightning strikes would likely be a function of the height of the wind turbine generators (WTGs) and be proportional to the number of project structures installed (i.e., which alternative is selected). In accordance with required federal safety standards, the turbines and substation would include lightning protection systems.

A fire could occur in the turbines, or the project electrical systems as a result of equipment malfunction, lightning strike, electrical short, terrorism, sabotage, vandalism, or aircraft impact.

Temperature sensors and fluid level detectors would detect internal fires and send an alarm signal to the central SCADA system, which would notify project operators of the situation.

Health and safety decommissioning impacts for all off-site alternatives would be similar to construction impacts.

Kittitas Valley Alternative

Shadow flicker impacts were evaluated for 17 residences in vicinity of the project. Although three residences would be exposed to lengthier shadow flicker effects, it was determined that the exposure would not result in health effects for the residents. The project proponent would also develop and implement a fire protection and prevention plan for both construction and operation activities, in coordination with the Kittitas County Fire Marshal and other appropriate agencies.

Desert Claim Alternative

Shadow-flicker caused by wind turbines is not expected to result in health effects in residential areas. 38 of 45 receptors would however experience varying degrees of exposure to shadow flicker. Micro siting some turbines was determined as a possible mitigation measure to reduce exposure of some receptors.

The proponent would implement recommendations received from the Kittitas county Fire Marshal to mitigate fire hazards in the project area.

Springwood Ranch Alternative

Because the Springwood Ranch alternative is an overall smaller proposal, with less turbines, and less miles of access roads, it may present a lower fire and explosion risk during both construction and operation.

Detailed analyses of potential shadow flicker impacts were not performed for the hypothetical layout for the Springwood Ranch alternative. It is expected that, based on the hypothetical layout, some residences on the eastern edge of Sunlight Waters would be exposed to shadow-flicker (based on a 2,000-foot distance threshold).

Swauk Valley Ranch Alternative

Because the Swauk Valley Ranch alternative is an overall smaller proposal, with less turbines, and less miles of access roads, it may present a lower fire and explosion risk during both construction and operation.

Detailed analyses of potential shadow flicker impacts were not performed for the hypothetical layout for the Swauk Valley Ranch alternative. It is expected that, based on the hypothetical layout some residences concentrated along the Yakima River and to the south of the proposed site could be exposed to shadow-flicker (based on a 2,000-foot distance threshold).

3.15.3.2 Impacts of No Action Alternative

Under the No Action Alternative, the proposed project would not be constructed. The electrical energy that would be produced by the project would need to be obtained from some other generation source. The risk of fire due to lightning strikes or human activity in the general area would still exist.

3.15.4 Mitigation Measures

In addition to those mitigation measures already identified above, the following would be implemented to reduce the risks to health and safety.

3.15.4.1 Fire and Explosion

Table 3.15-2 provides the mitigation measures that would be implemented to reduce risk of fire and explosion.

Table 3.15-2. Fire and Explosion Risk Mitigation Measures

Type of Impact Construction (C) Operation (O) Decommissioning (D)	Potential Fire or Explosion Source	Mitigation Measures
C, O, D	General fire protection	All onsite service vehicles will be fitted with fire extinguishers. Fire station boxes with shovels, water tank sprayers, etc., will be installed at multiple locations on site along roadways during summer fire season. A minimum of one water truck with sprayers will be present on each turbine string road during construction activities during fire season.
C, O, D	Dry vegetation in contact with hot exhaust catalytic converters under vehicles	No gas-powered vehicles will be allowed outside of graveled areas. Mainly diesel vehicles (i.e., without catalytic converters) will be used on site. Any vehicles used off road on site will be high-clearance vehicles.
C, O, D	Smoking	Restricted to designated areas (outdoor gravel covered areas).
C, O	Explosives used during blasting for excavation work	Only state-licensed explosive specialist contractors are allowed to perform this work. Explosives require special detonation equipment with safety lockouts. Vegetation will be cleared from the general footprint area surrounding the excavation zone to be blasted. Standby water spray trucks and fire suppression equipment will be present during blasting activities.
C, O	Electrical fires	All equipment will be designed to meet NEC and NFPA standards. All area surrounding substation, fused switch risers on overhead pole line, junction boxes and pad switches will be graveled with no vegetation.

Type of Impact Construction (C) Operation (O) Decommissioning (D)	Potential Fire or Explosion Source	Mitigation Measures
		A fire suppressing, rock-filled oil containment trough will be created around the substation transformer.
C, O, D	Lightning	Specially engineered lightning protection and grounding systems will be used at wind turbines and at substation.
		Footprint areas around turbines and substation will be graveled with no vegetation.
C, D	Portable generators – hot exhaust	Generators will not be allowed to operate on open grass areas.
		All portable generators will be fitted with spark arrestors on exhaust system.
C, D	Torches or field welding on site	Immediate surrounding area will be wetted with water sprayer.
		Fire suppression equipment will be present at location of welder/torch activity.
C, O	Electrical arcing	Electrical designs and construction specifications will meet or exceed requirements of NEC and NFPA.

Release or Potential Release of Hazardous Materials

Phase I Environmental Site Assessment

The applicant conducted a Phase I Environmental Site Assessment (ESA) for the project site. The Phase I ESA did not reveal the presence or potential presence of any environmental contamination on the project site. In the event that contaminated soil would be encountered during construction, the applicant would coordinate with the Washington Department of Ecology to determine the measures to be taken.

Emergency Medical Response

Medical emergencies would normally be handled by calling 911 and alerting the Emergency Medical Services (EMS) system. The City of Ellensburg Fire Department provides EMS for the entire County, directly billing for services that include treating burns, fractures, lacerations, fall injuries, and heart attacks. Ambulances are located in Ellensburg and Kittitas; Cascade Search and Rescue is located in Ellensburg. Emergency calls are dispatched through the sheriff's office to the fire districts that provide search and rescue support.

Kittitas Valley Community Hospital in Ellensburg serves the entire County. The hospital has level four trauma service, with a limited number of specialists available. Patients with head injuries, severe burns, and/or trauma are transported to a different facility, usually Harbor View Medical Center in Seattle. Less severe accident victims are sometimes transported to Yakima for hospitalization and treatment. There is a heliport on the roof of the hospital, and a helicopter is available for emergency response. MedStar, a critical care transport service located in Moses Lake, Washington, also provides air ambulance support services to the County.

All operations personnel working on the turbines would work in pairs. All turbine maintenance staff would be trained in lowering injured personnel should an injury occur while working in the nacelle. A rescue basket, specifically designed for that purpose, would be kept at the operations and maintenance facility and would be available for use by local EMS staff. Training in use of the basket would be provided to local EMS staff.

Compliance with Standards

The wind turbines for the proposed project would meet international engineering design and manufacturing safety standards including the International Electrotechnical Commission standard 61400-1: Wind Turbine Generator Systems–Part I: Safety Requirements.

Aircraft Impact

The project facilities would be marked and lighted in accordance with FAA regulations to minimize the potential for a low-flying aircraft to collide with a structure.

Transmission Line Audible Noise and Electromagnetic Interference

The conductors for the proposed transmission line would be of sufficient diameter to control corona effects. Also, the applicant has indicated that special care would be employed during construction to minimize nicks and scrapes to the conductors.

Emergency Plans

Emergency plans would be prepared by the applicant to protect public health and safety, and the environment on and off the site in the case of a major natural disaster or industrial accident relating to or affecting the proposed project. The applicant would be responsible for implementing the plans in coordination with the local emergency response support organizations. The plans would address the following:

- medical emergencies;
- construction emergencies;
- project evacuation;
- fire protection and prevention;
- floods;
- extreme weather abnormalities;
- earthquakes;
- volcanic eruption;
- facility blackout;
- spill prevention, control, and countermeasures;
- blade or tower failure;

- aircraft impact;
- terrorism, sabotage, or vandalism; and
- bomb threat.

Section 4.6 of the ASC provides a brief description of the plans. EFSEC, as well as local emergency response organizations, would review and approve all plans before they were implemented. During the construction and startup period, the emergency plans would be revised, as needed, to conform to manufacturer and vendor safety information for the specific equipment installed. Preliminary operations and maintenance emergency plans would similarly be developed and approved prior to the start of project operations.

The project operating and maintenance group and all contractors would receive regular emergency response training as part of the regular safety-training program to ensure that effective and safe response actions would be taken to reduce and limit the impact of emergencies at the project site.

3.15.5 Significant Unavoidable Adverse Impacts

With the possible exception of impacts associated with lightning strikes, no significant unavoidable adverse impacts to health and safety would result from the construction, operation and maintenance, or decommissioning of the proposed project.